(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 132 256**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **02.12.87**

(51) Int. Cl.⁴: **B 60 K 20/06**, F 16 H 21/54

(21) Application number: **84900254.8**

(22) Date of filing: **12.12.83**

(86) International application number:
PCT/US83/01937

(87) International publication number:
WO 84/02312 21.06.84 Gazette 84/15

(54) **DEVICE TO TRANSLATE ROTARY MOTION INTO RECIPROCATING MOTION.**

(30) Priority: **17.12.82 US 450723**

(43) Date of publication of application:
30.01.85 Bulletin 85/05

(45) Publication of the grant of the patent:
02.12.87 Bulletin 87/49

(84) Designated Contracting States:
DE FR GB SE

(56) References cited:
DE-A-2 443 637
DE-B-1 033 063
US-A-1 146 322
US-A-1 426 686
US-A-3 298 243
US-A-3 444 701
US-A-3 771 384
US-A-4 261 282
US-A-4 292 859

(73) Proprietor: **Acco Babcock Inc.**
425 Post Road
Fairfield Connecticut 06430 (US)

(72) Inventor: **GILMORE, William, John**
Manitou Beach
MI 49253 (US)

(74) Representative: **Lewis, David Overington**
c/o Babcock International plc Cleveland House
19 St. James's Square
London SW1Y 4LN (GB)

EP 0 132 256 B1

Courier Press, Leamington Spa, England.

Description

This invention relates to a device to translate rotary motion into reciprocating motion. More particularly the invention relates to a gear shift mechanism for an automobile wherein the gear shift lever on a steering column is connected by a flexible core to an automatic transmission and wherein rotary or arcuate movement of the gear shift lever will cause the core to move in a straight line movement to actuate the automatic transmission.

In US—A—1146322, corresponding to the preamble of claim 1, there is disclosed a device to translate rotary motion into reciprocating motion comprising a rigid tubular guide conduit having an arcuate portion including a keyhole slot extending through a side wall of the conduit, a straight portion and a curved portion connecting the arcuate and portions, a flexible conduit connected at one end of the second portion remote from the curved portion, a flexible core member capable of transmitting tension and compression loads movable in the guide conduit and the flexible conduit, and a tab extension extending through the keyhole slot connected to an end of the core member.

The invention is characterized in that there is provided a flexible sheath engaging with an outer periphery of the core member adjacent the tab extension and with an inner periphery of the curved portion and the arcuate portion which flexible sheath is substantially equal to the length of the arcuate portion and the curved portion to minimise any lost motion between the core member and the guide conduit when rotary motion of the end of the core member connected to the tab extension is transformed into reciprocating motion of the core member in the straight portion and in the flexible conduit.

Conventional steering column gear shift levers are mechanically linked to a lever arm at the bottom of the steering column of an automobile. Because it is necessary for safety purposes to design the steering column to collapse in the event it is impacted in an accident, it is necessary that relatively expensive telescopic shear means be utilized in the gear shift linkage to accommodate a collapse of the steering column. Further the use of such linkages requires use or rods, lever arms and bell cranks resulting in considerable weight and in considerable expense involved in forming the various parts and in assembling the parts.

The need to provide rigid linkages and telescopic shear means can be avoided by utilizing a flexible core and conduit arrangement. However, hitherto such flexible core and conduit arrangements have not provided requisite accuracy necessary to position automatic transmission mechanisms.

The construction of the present invention whilst retaining accuracy in translation of motion eliminates the use of complicated linkage systems while at the same time provides flexibility in the event the steering column collapses under impact loads since the core and conduit are both flexible.

An embodiment of the invention will now be described by way of example and with reference to the accompanying drawings in which:—

Figure 1 is a side sectional view of a steering column of an automobile to which a device constructed according to the invention is applied;

Figure 2 is an enlarged partial sectional plan view of a device constructed according to the invention as applied to an automatic gear shift control of an automobile;

Figure 3 is a partial sectional view of the device of Figure 2;

Figure 4 is an enlarged sectional view of Figure 2 taken along lines 4—4; and

Figure 5 is an enlarged sectional view of Figure 2 taken along lines 5—5.

Referring to Figures 1 and 2, there is illustrated a steering column 1 of an automobile including a steering wheel 2 and a steering shaft 3. A device for translating rotary motion into a reciprocating motion is mounted on the steering column and forms a part of the automatic transmission control of the automobile.

As shown the device comprises a rigid tubular guide conduit 5 having a first arcuate portion 6, a straight portion 7 which extends substantially perpendicular to the plane of the arcuate portion 6 and a third curved portion 8 which joins or connects the portions 6 and 7. With reference to Figure 2, the plane of the arcuate portion 6 is coplanar with that of the drawing while the second straight portion 7 extends perpendicular to the plane of the drawing. The third curved portion 8 bends approximately 90° from the plane of the drawing downwardly to connect with the straight portion.

A keyhole slot 10 extends through a side wall of the arcuate portion 6 and circumscribes an arc of approximately 110°.

The rigid guide conduit 5 is connected at its end opposite the keyhole slot to a flexible conduit 15 which has a straight portion 16 extending parallel to and within the steering column 1.

A core member 17 extends through flexible conduit 15 as well as the rigid guide conduit 5 and has a tab 18 connected at one end by crimping or other means. The tab 18 includes an extension 18' which extends through the keyhole slot 10. As seen in Figures 1 and 2 movement of the tab in the rigid arcuate portion 6 will cause the core member 17 to move in the arcuate portion 6 as well as in the curved portion 8 and straight portion 7 such that the arcuate or rotary motion of the tab 18 about the centre of curvature of the arcuate portion i.e. about a central axis of the steering shaft 3, will result in linear motion of the core 17 within the straight portion 7 of the rigid guide conduit as well as within the flexible conduit 15

Preferably the core member 17 has a flexible sheath 20 engaging the inner periphery of the curved portion 8 of the guide conduit, as shown in

Figure 5, of the arcuate portion 6 when the tab extension is at the end of its rotational travel in the clockwise direction with reference to Figure 2. Thus the sheath should extend a length equal to that of the combined lengths of the arcuate and curved portions 6 and 8. The sheath may comprise a plurality of individual tubular elements 21 as shown in Figure 3 to impart flexibility to the sheath or could comprise a single member ribbed or slotted in a radial direction to give flexibility. By this construction any looseness between the core member 17 and the inner periphery of the curved and arcuate portion of the guide conduit caused by spacing between the core and the inner peripheries is prevented thus eliminating any lost motion that might result from such spacing.

The core member 17 is preferably of the armored strand type and is capable of transmitting compression and tension loads.

Referring to Figure 2 a gear shift lever 30 is shown connected with the tab extension 18' in order to provide the force necessary to move the tab extension within the slot 10. An indicia plate 31 is fixed with respect to the steering column 1 shown in Figure 1 to provide an indication of the positioning of the gear shift lever to achieve the desired operating mode of an automatic transmission with which the core member 17 connects. An indicator, not shown, is operably connected to the lever 30 to point to one of the selected indicia determined by positioning of the lever.

The device is designed such that movement of the operating lever out of "park" exerts a tension force on the core member 17. A tension force is desired rather than a compression force since the heaviest load that is encountered in operation of an automatic transmission is movement of the gear lever from the "park" position. This feature is purposely designed into automatic transmissions as a safety measure to reduce chance of inadvertent movement of the gear shift lever from the "park" position to an operating position.

It is seen that a device constructed according to the invention eliminates use of complicated linkages and because flexible conduits and cores are used, the parts are light-weight and may easily collapse upon collapse of the steering column.

While the device is illustrated in the drawings as applied to a gear shift mechanism for an automatic transmission, the device could be used in other applications where it is necessary or desirable to translate a rotary motion to a linear motion.

Claims

1. A device to translate rotary motion into reciprocating motion, the device comprising a rigid tubular guide conduit (5) having an arcuate portion (6) including a keyhole slot (10) extending through a side wall of the conduit (5), a straight portion (7) and a curved portion (8) connecting the arcuate and straight portions (6, 7), a flexible conduit (15) connected at one end of the straight portion (7) remote from the curved portion (8), a flexible core member (17) for transmitting tension and compression loads movable in the guide conduit (5) and the flexible conduit (15), and a tab extension (18') extending through the keyhole slot (10) and connected to an end of the core member (17) characterized in that a flexible sheath 20 engages with an outer periphery of the core member (17) adjacent the tab extension (18') and with an inner periphery of the curved portion (8) and the arcuate portion (6) which flexible sheath (20) is substantially equal to the length of the arcuate portion (6) and the curved portion (8) to minimise any lost motion between the core member (17) and guide conduit (5) when rotary motion of the end of the core member (17) connected to the tab extension (18') is transformed into reciprocating motion of the core member (17) in the straight portion (7) and in the flexible conduit (15).

2. A device according to claim 1, in which the flexible sheath (20) comprises a plurality of tubular elements (21) surrounding the core member (17).

3. A device according to claim 1 or claim 2, in which a gear shift lever (30) is located on the tab extension (18') and the flexible conduit (15) is located on a steering column.

Patentansprüche

1. Vorrichtung zur Übertragung einer Drehbewegung auf eine Hin- und Herbewegung mit folgenden Merkmalen: eine steife, rohrförmige Führungsleitung (5) weist ein bogenfömiges Teil (6) mit einem sich durch eine Seitenwand der Leitung (5) erstreckenden Schlüssellochschlitz (10), ein gerades Teil (7) und ein gekrümmtes Teil (8) auf, welches den bogenförmigen und den geraden Teil (6, 7) miteinander verbindet; eine beigsame Leitung (15) ist an einem Ende des geraden Teils (7) entfernt von dem gekrümmten Teil (8) angeschlossen; ein biegsames Kernglied (17) zur Übertragung von Zug- und Druckkräften ist in der Führungsleitung (5) und der biegsamen Leitung (15) beweglich geführt, und eine fahnenartige Verlängerung (18') erstreckt sich durch den schlüssellochförmigen Schlitz (10) und ist mit dem Ende des Kerngliedes (17) verbunden; dadurch gekennzeichnet, daß eine biegsame Hülle (20) benachbart dem fahnenartigen Fortsatz (18') in Berührung mit dem Außenumriß des Kerngliedes (17) und mit einem Innenumriß des gekrümmten Teils (8) und des bogenförmigen Teils (6) steht, und daß die biegsame Umhüllung (20) im wesentlichen gleich der Länge des bogenförmigen Teils (6) und des gekrümmten Teils (8) ist, um das Spiel zwischen dem Kernglied (17) und der Führungsleitung (5) möglichst klein zu halten, wenn die Drehbewegung des mit dem fahnenförmigen Fortsatz (18') verbundenen Endes des Kerngliedes (17) in eine Hin- und Herbewegung des Kerngliedes (17) im geraden

Teil (7) und in der biegsamen Führung (15) übersetzt wird.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die biegsame Hülle (20) eine Mehrzahl von rohrförmigen Elementen (21) aufweist, welche das Kernglied (17) umgeben.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein Gangschaltungshebel (30) an dem fahnenförmigen Fortsatz (18') angeordnet und daß die biegsame Leitung (15) an einer Steuersäule angeordnet ist.

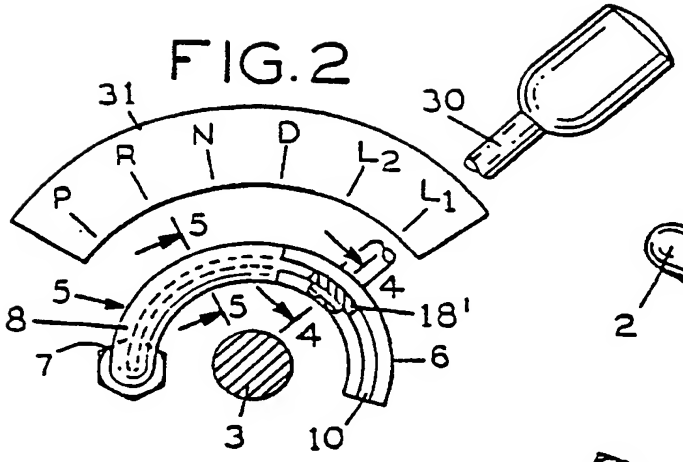
Revendications

1. Dispositif pour transformer un mouvement de rotation en mouvement de va-et-vient, le dispositif comprenant une gaine de guidage tubulaire rigide (5) comportant un tronçon arqué (6) qui présente une fente en trou de serrure (10) traversant la paroi latérale de la gaine (5), un tronçon rectiligne (7), et un tronçon courbe (8) reliant les tronçons arqué et rectiligne (6, 7), une gaine souple (15) reliée à une extrémité du tronçon rectiligne (7) distante du tronçon courbe 8, un câble souple (17) de transmission de charges de traction et de compression mobile dans la gaine de guidage (5) et dans la gaine souple (15), et un prolongement de patte (18') traversant la fente en trou de serrure (10) et relié à une extrémité du câble (17), caractérisé en ce qu'un fourreau souple (20) est en contact avec un pourtour extérieur du câble (17) adjacent au prolongement de patte (18') et avec un pourtour périphérique intérieur du tronçon courbe (8) et du tronçon arqué (6), lequel fourreau souple (20) a une longueur sensiblement égale à la longueur du tronçon arqué (6) et du tronçon courbe (8) pour minimiser tout mouvement perdu entre le câble (17) et la gaine de guidage (5) quand le mouvement de rotation de l'extrémité du câble (17) reliée au prolongement de patte (18') est transformé en mouvement de va-et-vient du câble (17) dans le tronçon rectiligne (7) et dans la gaine souple (15).

2. Dispositif selon la revendication 1, dans lequel le fourreau souple (20) est constitué par une série d'éléments tubulaires (21) entourant le câble (17).

3. Dispositif selon la revendication 1 ou 2, dans lequel un levier de changement de vitesses (30) est situé sur le prolongement de patte (18') et la gaine souple (15) est située sur une colonne de direction.

FIG.2



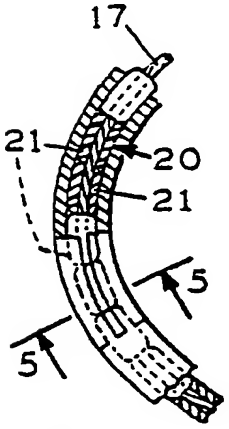


FIG.3

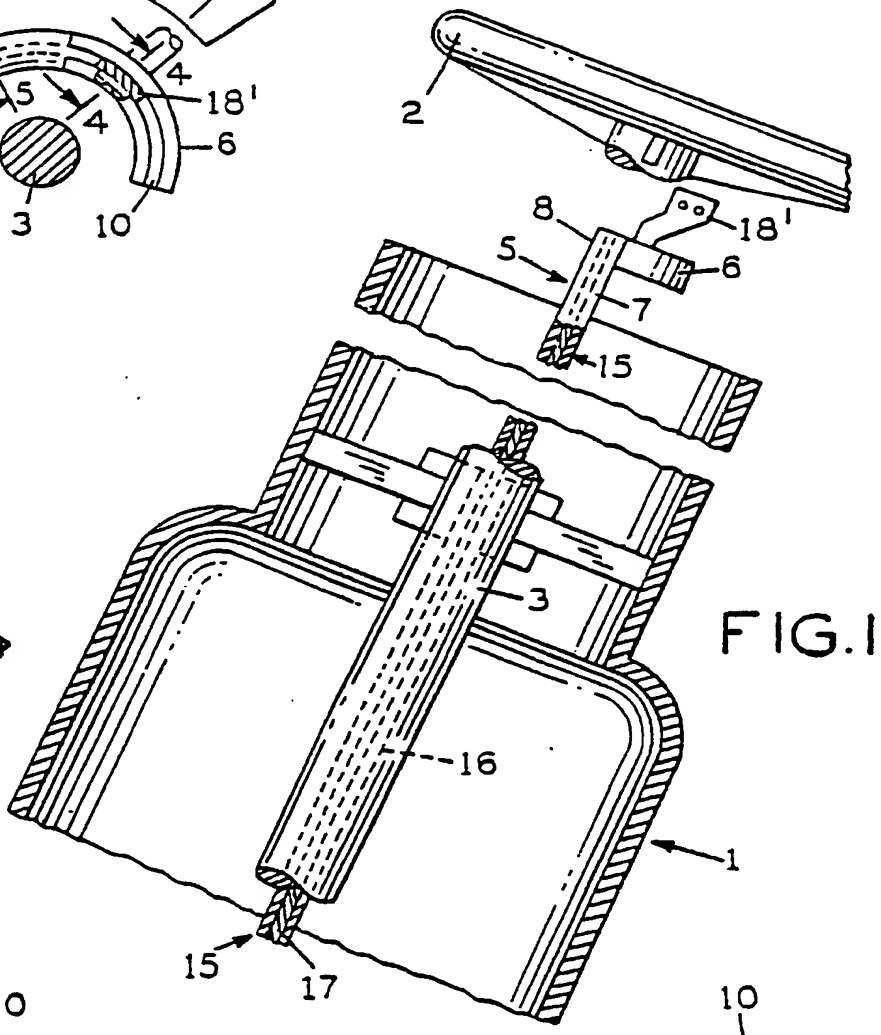


FIG.1

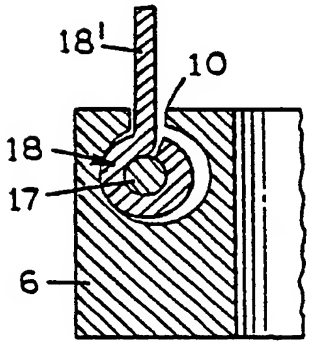


FIG.4

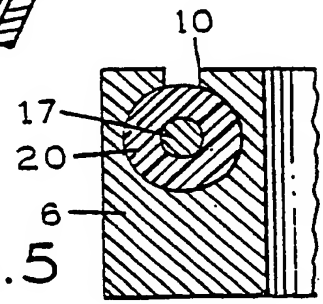


FIG.5